9th Class 2017

Chemistry	Group-II	Paper-I
Time: 1.45 Hours	(Subjective Type)	Marks: 48

(Part-I)

Q.2. Write short answers to any FIVE (5) questions: 10

(i) How does homogeneous mixture differ from heterogeneous mixture?

Ans Mixtures that have uniform composition throughout are called homogeneous mixtures *e.g.*, air, gasoline, ice-cream. Whereas, heterogeneous mixtures are those in which composition is not uniform throughout *e.g.*, soil, rock and wood.

(ii) Calculate the molecular mass of nitric acid.

Ans Atomic mass of H = 1 amu
Atomic mass of N = 14 amu
Atomic mass of O = 16 amu
Molecular formula = HNO_3

Molecular mass = 1 (At. mass of H) + 1 (At. mass of N) + 3 (At. mass of O)
= 1 + 14 + 3(16)
= 1 + 14 + 48
= 63 amu

(iii) State plum pudding theory.

Ans 'Plum pudding theory' was put forth by J.J. Thomson. According to this theory, the atoms are solid structures of positively charged particles with tiny negative particles stuck inside. It is like plums in the pudding.

(iv) Write two properties of neutron particles.

Ans Two properties of neutron particles are as follows:

1. Neutrons carry no charge, *i.e.*, they are neutral.
2. They are highly penetrating.

(v) How is goiter in thyroid gland detected?

Ans Isotopes of Iodine-131 are used for diagnosis of goiter in thyroid gland.

(vi) What are triads? Give example.

Ans A German chemist Dobereiner observed relationship between atomic masses of several groups of three elements called triads. In these groups, the central or middle elemen had atomic mass average of the other two elements. One triad group example is that of calcium (40), strontium (88) and barium (137). The atomic mass of strontium is the average o the atomic masses of calcium and barium.

(vii) What is meant by periodic functions?

Ans By periodic functions, we mean recurrence o properties periodically or at regular intervals.

(viii) Define atomic radius. Give its units.

Ans The half of the distance between the nuclei of the two bonded atoms is referred to as the atomic radius o the atom. For example, the distance between the nuclei o two carbon atoms in its elemental form is 154 pm, means that its half 77 pm is the radius of carbon atom.

Q.3. Write short answers to any FIVE (5) questions: 1

(i) Why metals are good conductor of electricity?

Ans Metals are good conductors of electricity in soli state due to mobile electrons.

(ii) What do you mean by hydrogen bonding?

Ans Partially positively hydrogen of one molecul attracts and forms a bond with the partially negativel charge atom of the other molecule, the bonding is calle hydrogen bonding.

(iii) What do you mean by donor and acceptor i covalent bond?

Ans In covalent bond, the atom which donates th electron pair is called donor and the atom which accept the electron pair is called acceptor.

(iv) Define metallic bond.

Ans A bond formed between the metal atoms (positivel charged ions) due to free electrons is called metallic bond.

(v) Differentiate between diffusion and effusion.

Ans "Diffusion is spontaneous mixing up of molecules by random motion and collisions to form a homogeneous mixture." While "Effusion is escaping of gas molecules through a tiny hole into a space with lesser pressure."

(vi) What do you mean by mobility of gases?

Ans Gas molecules are always in state of continuous motion. They can move from one place to another because gas molecules possess very high kinetic energy. They move through empty spaces that are available for the molecules to move freely. This mobility or random motion results in mixing up of gas molecules to produce a homogeneous mixture.

(vii) Why drops of rain fall downward?

Ans Density of water is 1.0 g cm^{-3} while that of air is 0.001 g cm^{-3}. That is the reason why drops of rain fall downward.

(viii) Why does ice float on water?

Ans The ice floats on the surface of water due to hydrogen bonding. The important phenomenon of floating of ice over water is because of hydrogen bonding. The density of ice at 0°C (0.917 gcm^{-3}) is less than that of liquid water at 0°C (1.00 gcm^{-3}). In the liquid state water molecules move randomly. However, when water freezes, the molecules arrange themselves in an ordered form, that gives them open structure. This process expands the molecules, that results in ice being less dense as compared to water.

Q.4. Write short answers to any Five (5) questions: 10

(i) What do you mean by volume / volume %?

Ans It is the volume in cm^3 of a solute dissolved per 100 cm^3 of the solution.

$$\% \text{ by volume} = \frac{\text{volume of solute } (cm^3)}{\text{volume of solution } (cm^3)} \times 100$$

(ii) What is molarity? Give its formula.

Ans Molarity is a concentration unit defined as number of moles of solute dissolved in one dm^3 of the solution. It is represented by M.

$$\text{Molarity (M)} = \frac{\text{No. of moles of solute}}{\text{Volume of solution } (dm^3)}$$

(iii) What is the function of salt bridge?

Ans Salt bridge is a U-shaped glass tube. It consists of a saturated solution of strong light supported in a jelly-type material. The ends of the U tube are sealed with a porous material like a glass wool. The function of the salt bridge is to keep the solutions of two half cells neutral by providing a pathway for migration of ions.

(iv) Define oxidation in term of electrons. Give an example.

Ans Oxidation is loss of electrons by an atom or an ion. *e.g.*,

$$Zn_{(s)} \longrightarrow Zn^{+2}_{(aq)} + 2e^-$$

$$Fe^{+2}_{(aq)} \longrightarrow Fe^{+3}_{(aq)} + e^-$$

(v) Which force drives the non-spontaneous reaction to take place?

Ans Electricity is used to drive the non-spontaneous reaction to take place.

(vi) Why copper is used for making electrical wires?

Ans Copper is used for making electrical wires because:

1. resistance decreases;
2. band gap of energy decreases;
3. mobile electrons can be easily moved through one place to another;
4. the flow of electrons maximizes.

(vii) What do you mean by 24 carat gold?

Ans Purity of gold is shown by carats that indicates the number of parts by weight of gold that is present in 24 parts of alloy.

(viii) **Give the applications of silver.**

Ans The alloys of silver with copper are widely used in making coins, silver wires and ornaments. Moreover, the compounds of silver are widely used in photographic films and dental preparations. Silver also has important applications in mirror industry.

(Part-II)

NOTE: Attempt any TWO (2) questions.

Q.5.(a) Differentiate between a compound and mixture. (any five) (5)

Ans **Differences between compound and mixture:**

	Compound	Mixture
(i)	It is formed by a chemical combination of atoms of elements.	Mixture is formed by the simple mixing up of the substances.
(ii)	The constituents lose their identity and form a new substance having entirely different properties from them.	Mixture shows the properties of the constituents.
(iii)	Compounds always have fixed composition by mass.	The minimum number and ratio of the components may not be fixed.
(iv)	The components cannot be separated by physical means.	The components can be separated by simple physical methods.
(v)	Every compound is represented by a chemical formula.	It consists of two or more components and does not have any chemical formula.

(b) What is isotope? Describe the isotopes of hydrogen with diagram. (4)

Ans **ISOTOPES:**

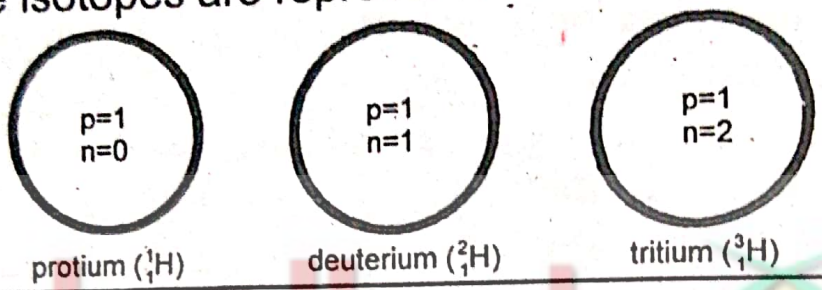
Isotopes are defined as "the atoms of an element that have same atomic number but different mass

numbers." They have same electronic configuration and number of protons but they differ in the number of neutrons.

Isotopes of Hydrogen:

The naturally occurring hydrogen is combination of its three isotopes, present in different abundances. The three isotopes of hydrogen are named as protium ($^{1}_{1}H$), deuterium ($^{2}_{1}H$, or D) and tritium ($^{3}_{1}H$ or T). Each one of them has 1 proton and 1 electron, but number of neutrons are different.

The isotopes are represented as:



Q.6.(a) Define covalent bond. Give its types with one example each. (5)

Ans Covalent Bond:

The elements of Group-13 to Group-17 when allowed to react with each other, they form a chemical bond by mutual sharing of their valence shell electrons. This type of *bond, which is formed due to mutual sharing of electrons, is called a covalent bond.*

Types of covalent bonds:

As described above, the covalent bond is formed by mutual sharing of electrons between two atoms. The electrons that pair up to form a chemical bond are called 'bond pair' electrons. Depending upon the number of bond pairs, covalent bond is classified into following three types:

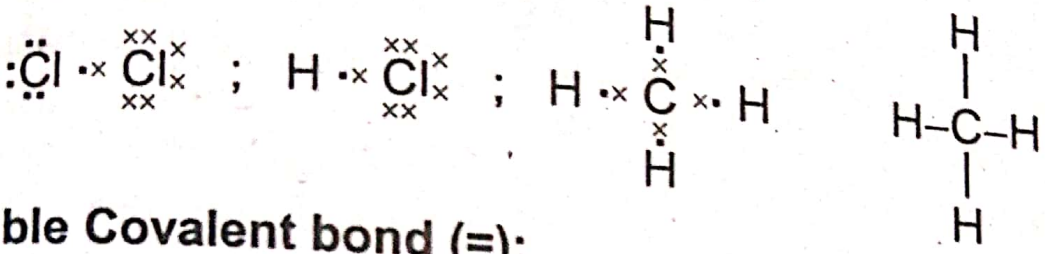
1. Single Covalent bond (—):

"When one electron is contributed by each bonded atom, one bond pair is formed and it forms a single covalent bond."

While drawing the structure of such molecules, the single bond pair is indicated by a line between those two atoms. A few examples of molecules with single covalent bonds are hydrogen (H_2), chlorine (Cl_2), hydrochloric acid (HCl) and methane (CH_4).

$$H\cdot + \times H \longrightarrow H \cdot\times H \quad \text{or} \quad H — H \; ; \; H_2$$

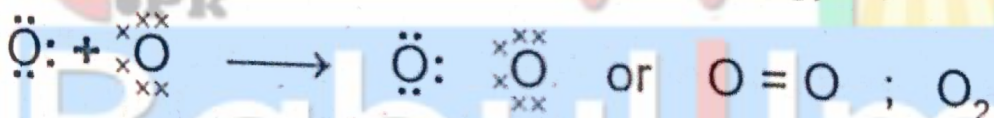
single covalent bond



2. Double Covalent bond (=):

"When each bonded atom contributes two electrons, two bond pairs are shared and a double covalent bond is formed."

These bond pairs are indicated as double line between those atoms in the structure of such molecules. The molecules like oxygen (O_2) gas and ethene (C_2H_4) show such type of double covalent bonds.

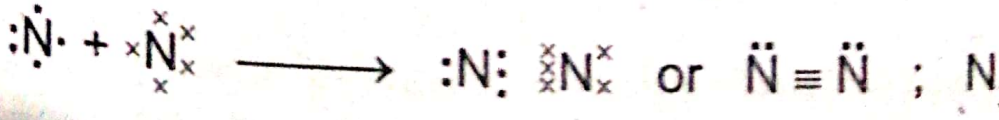


double covalent bond

3. Triple Covalent Bond (≡) :

"When each bonded atom contributes three electrons, three bond pairs are involved in bond formation. This type is called triple covalent bond."

Three small lines are used to indicate these three pairs of electrons between those atoms in the molecules of such compounds. The examples of molecules having triple covalent bonds are nitrogen (N_2) and ethyne (C_2H_2).



triple covalent bond

By this mutual sharing of valence shell electrons, each of the contributing atom attains the 'Octet' or nearest nobel gas electronic configuration.

(b) State Charles's Law and write down its experimental verification. (4)

Ans **Charles' Law:**

French scientist J. Charles in 1787 presented his law that states "the volume of a given mass of a gas is directly proportional to the absolute temperature if the pressure is kept constant." French scientist J. Charles, in 1787 presented his law that states "the volume of a given mass of a gas is directly proportional to the absolute temperature if the pressure is kept constant". When pressure P is constant, the volume V of a given mass of a gas is proportional to absolute temperature T. Mathematically, it is represented as:

Volume $\propto$ temperature represented as $V \propto T$

or $V = kT$ or $\frac{V}{T} = k$

where k is proportionality constant. If temperature of the gas is increased, its volume also increases. When temperature is changed from T_1 to T_2, the volume changes from V_1 to V_2. The mathematical form of Charles' Law will be:

$$\frac{V_1}{T_1} = k \quad \text{and} \quad \frac{V_2}{T_2} = k$$

As both equations have same value of constant therefore, their variables are also equal to each other

$$\therefore \quad \frac{V_1}{T_1} = \frac{V_2}{T_2}$$

Experimental verification of Charles' law:

Take a certain amount of a gas enclosed in a cylinder having a moveable piston. If the initial volume of

the gas V_1 is 50 cm^3 and initial temperature T_1 is 25°C. On heating the cylinder up to 100°C, its new volume V_2 is about 62.5 cm^3. The increase in temperature increases the volume of the gas as shown in the fig;

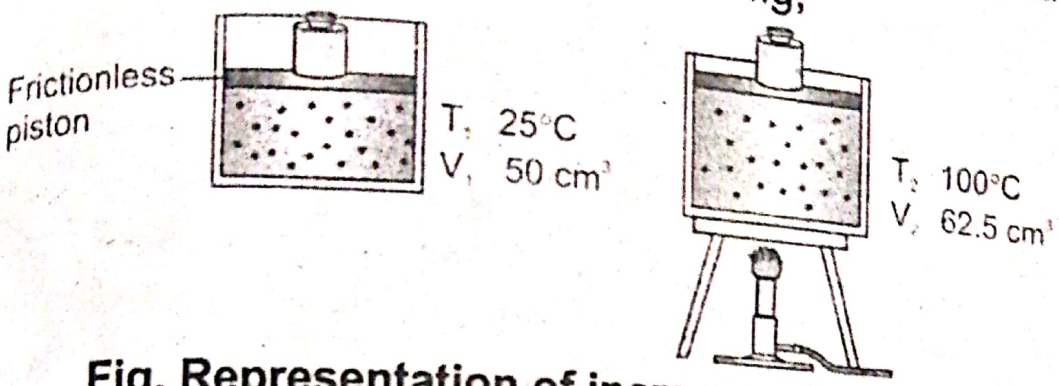


Fig. Representation of increase of volume with the increase of temperature.

Q.7.(a) Write down any five properties of colloid. (5)

Ans Following are five properties of colloid:

(i) The particles are large consisting of many atoms, ions or molecules.

(ii) A colloid appears to be a homogeneous but actually it is a heterogeneous mixture. Hence, they are not true solution. Particles do not settle down for a long time, therefore, colloids are quite stable.

(iii) Particles are large but can't be seen with naked eye.

(iv) Although particles are big but they can pass through filter paper.

(v) Particles scatter the path of light rays thus emitting the beam of light *i.e.*, exhibit the tyndall effect.

(b) Describe in detail the electrolysis of NaCl (fused) in Down's cell. (4)

Ans **Manufacture of Sodium Metal from Fused NaCl:**

On the industrial scale, molten sodium metal is obtained by the electrolysis of fused NaCl in the Down's cell. This electrolytic cell is a circular furnace. In the center, there is a large block of graphite, which acts as an anode while cathode around it is made of iron as shown in figure.

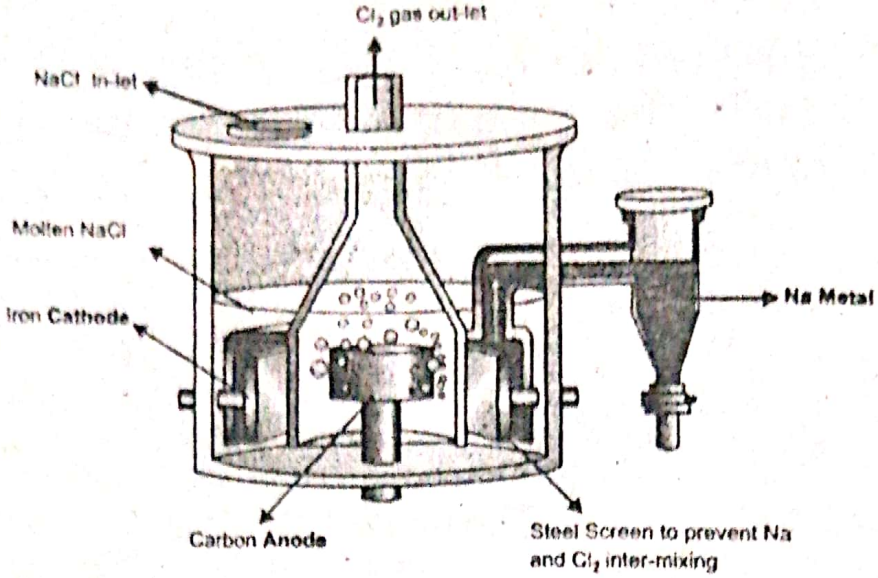


Fig. Down's Cell for production of Sodium Metal.

Working of Down's Cell:

The fused NaCl produces Na^+ and Cl^- ions, which migrate to their respective electrodes on the passage of electric current. The electrodes are separated by steel gauze to prevent the contact between the products. The Cl^- ions are oxidized to give Cl_2 gas at the anode. It is collected over the anode within an inverted cone-shaped structure. While Na^+ are reduced at cathode and molten Na metal floats on the denser molten salt mixture from where it is collected in a side tube. Following reactions take place during the electrolysis of the molten sodium chloride:

Molten NaCl ionizes as;

$$2NaCl_{(s)} \rightleftharpoons 2Na^+_{(l)} + 2Cl^-_{(l)}$$

Half-cell reaction at anode (oxidation):

$$2Cl^-_{(l)} \longrightarrow Cl_{2(g)} + 2e^-$$

Half-cell reaction at cathode (reduction):

$$2Na^+_{(l)} + 2e^- \longrightarrow 2Na_{(l)}$$

Overall galvanic reaction is the sum of these two half-cell reactions.

$$2NaCl_{(fused)} \longrightarrow Cl_{2(g)} + 2Na_{(l)}$$